



**BIOLOGY
HIGHER LEVEL
PAPER 1**

Thursday 4 May 2006 (afternoon)

1 hour

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. Using a light microscope, what determines the ability to distinguish between two points lying close together?
 - A. The magnification
 - B. The preparation
 - C. The fixation
 - D. The resolution

2. Which of the following processes may be found in prokaryotes?
 - I. Photosynthesis
 - II. Nitrogen fixation
 - III. Respiration
 - IV. Protein synthesis
 - A. I only
 - B. I and II only
 - C. I, II and III only
 - D. I, II, III and IV

3. Which of the following correctly describes exocytosis?

	Plasma membrane increases in size	Plasma membrane is pulled inwards	Membranes fuse	Vesicles move away from plasma membrane
A.	No	Yes	No	Yes
B.	Yes	No	Yes	No
C.	No	Yes	Yes	Yes
D.	No	No	No	Yes

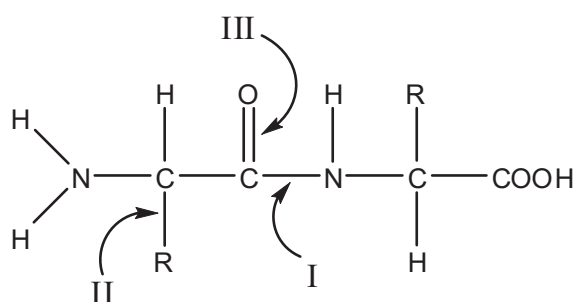
4. Which of the following processes take place during interphase?

- I. Respiration
 - II. Active transport
 - III. Protein synthesis
 - IV. Replication of DNA
- A. I only
 - B. I and II only
 - C. I, II and III only
 - D. I, II, III and IV

5. What is **one** role of the element phosphorus?

- A. It forms part of the structure of amino acids.
- B. It forms part of the structure of fatty acids.
- C. It forms part of the structure of ribose.
- D. It forms part of the structure of nucleotides.

6. Which of the following represents the peptide linkage of a dipeptide?

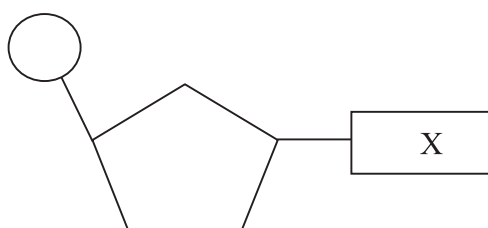


- A. I
- B. II
- C. III
- D. IV

7. What determines the specificity of an enzyme for its substrate?

- A. The temperature at which it is operating
- B. The optimum pH of the enzymes
- C. The concentration of the substrate
- D. The structure of the enzyme molecule

8. The diagram below represents a DNA nucleotide. What could the part labelled X represent?



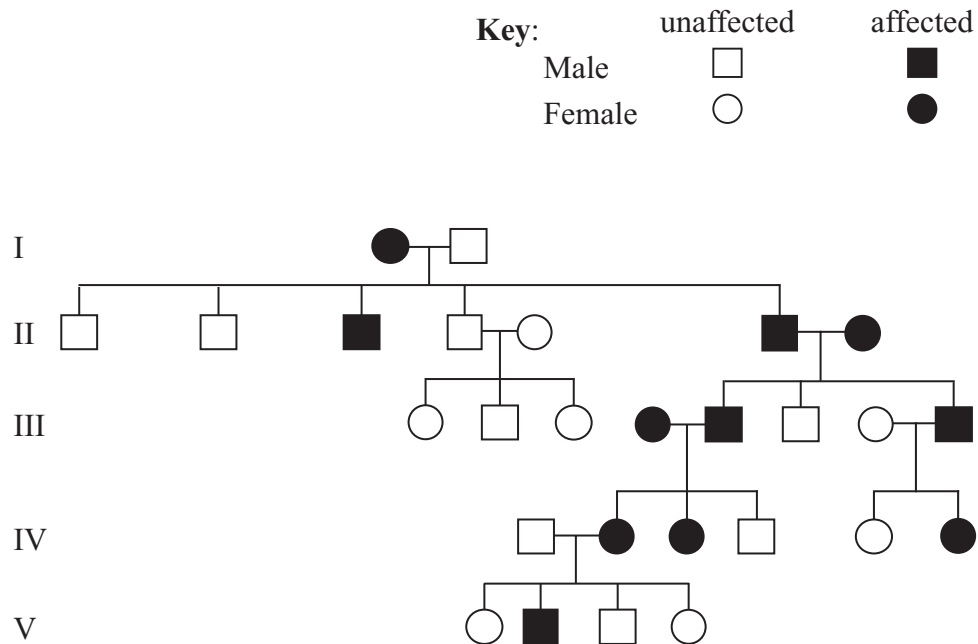
- A. Ribose
- B. Uracil
- C. Guanine
- D. Phosphate

9. During aerobic respiration in the cytoplasm of a cell what is produced from glucose?

- I. Pyruvate
 - II. CO_2
 - III. ATP
 - IV. Lactic acid
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. II and IV only

- 10.** What are the chromosomes of fungi made of?
- A. DNA only
 - B. DNA and protein only
 - C. DNA and RNA only
 - D. DNA, RNA and protein
- 11.** In the offspring what are the maternal and paternal pairs of chromosomes known as?
- A. Sex chromosomes
 - B. Autosomes
 - C. Sister chromatids
 - D. Homologous chromosomes
- 12.** A gene has three alleles. How many different genotypes can be found for this gene?
- A. 3
 - B. 6
 - C. 9
 - D. 12

13. The pedigree chart below shows the inheritance of a genetic disease in a family. What is the nature of the allele that causes this disease?

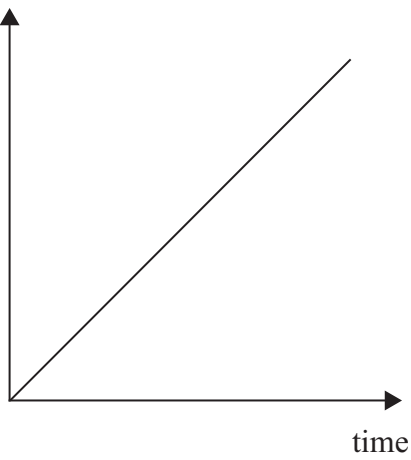


- A. Dominant and sex linked
- B. Dominant and non-sex linked
- C. Recessive and sex linked
- D. Recessive and non-sex linked
14. Which characteristics are used to identify chromosomes when constructing a karyotype?
- The length of the chromosome
 - The position of the centromere on the chromosome
 - The pattern of bands on the chromosome
 - The position of the chromosome on the spindle
- A. I only
- B. I and II only
- C. I, II and III only
- D. I, II, III and IV

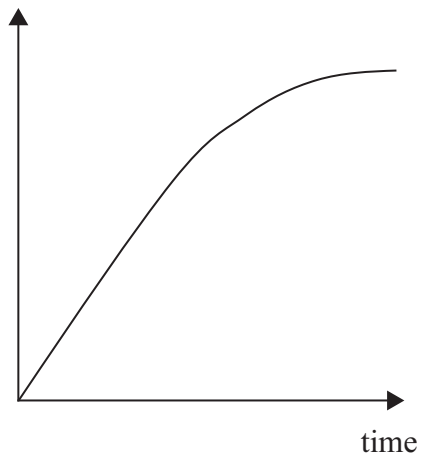
15. What units are used when constructing pyramids of energy?
- A. J
 - B. J m^{-2}
 - C. $\text{J m}^{-2} \text{ year}^{-1}$
 - D. $\text{J kg}^{-1} \text{ m}^{-2} \text{ year}^{-1}$
16. Tropical savannah is where large herds of herbivores live. It has been estimated that this ecosystem could be covered in a layer of animal faeces 5 cm thick in 24 hours. What stops this happening?
- A. The faeces are broken down by decomposers.
 - B. Heavy rainfall washes it away.
 - C. The faeces are absorbed by the vegetation.
 - D. Local farmers collect it to use as a fertilizer.
17. When estimating the size of a plant population in an area a random sample is often used. What is a random sample?
- A. A sampling method that covers every part of the area being investigated.
 - B. A sampling method that ensures that each part of the area being sampled has an equal chance of being measured.
 - C. A sampling method that systematically visits evenly spaced sites in the area being investigated.
 - D. A sampling method that only visits the parts of the area where the species is growing.

18. Which graph below best predicts the change in numbers of a population which arrives in an unoccupied habitat?

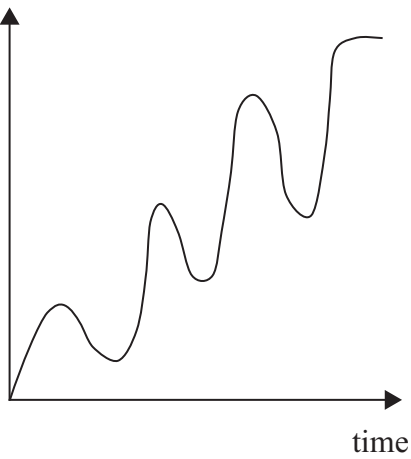
A. numbers



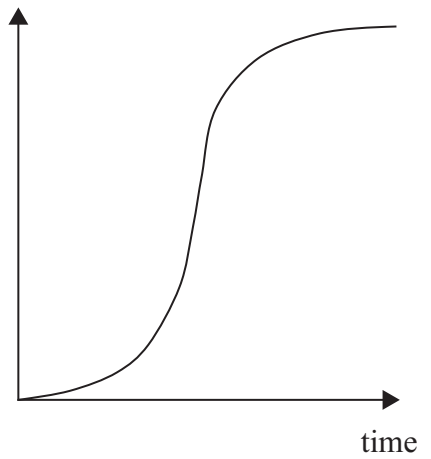
B. numbers



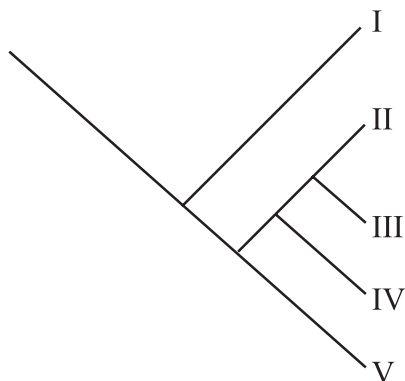
C. numbers



D. numbers



19. The evolutionary tree shown below classifies five species I to V. Which pair of species are the most closely related?



- A. I and II only
- B. II and III only
- C. III and IV only
- D. IV and V only
20. Which human activities may increase or decrease the greenhouse effect?

	Increases greenhouse effect	Decreases greenhouse effect
A.	Deforestation	More use of fossil fuels
B.	Reforestation	More use of solar power
C.	Less use of air conditioning	Less use of public transport
D.	More cattle farming	Reforestation

21. Which of the following molecules does not need digesting?

- A. Ribose
- B. Polynucleotides
- C. Polypeptides
- D. Disaccharides

22. Which is the correct sequence of events in a heart beat?

- A. Atria contract → Ventricles contract → Semi-lunar valves close → Atrio-ventricular valves close
- B. Atria contract → Atrio-ventricular valves close → Ventricles contract → Semi-lunar valves close
- C. Atria contract → Ventricles contract → Atrio-ventricular valves close → Semi-lunar valves open
- D. Ventricles contract → Atria contract → Atrio-ventricular valves close → Semi-lunar valves close

23. What are the characteristics of blood flowing in arteries and veins?

	Arteries	Veins
A.	Slow velocity	Fast velocity
B.	High pressure	Low pressure
C.	Deoxygenated	Oxygenated
D.	Greater than 37°C	Less than 37°C

24. What makes the skin a barrier to infectious diseases?

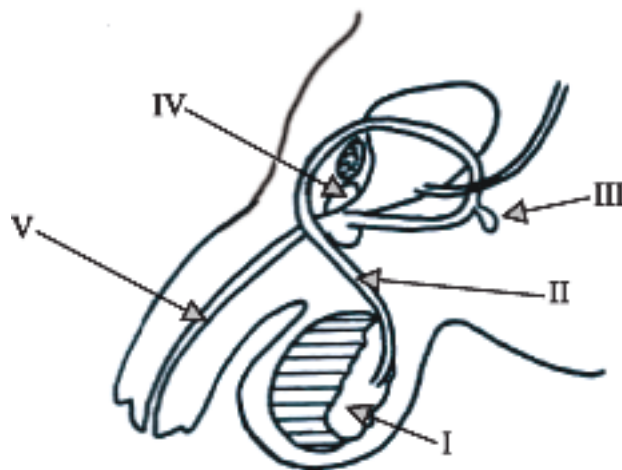
- A. Impermeable cells which are frequently replaced
- B. Patrolling phagocytes
- C. Cells coated in antibody molecules
- D. Cells which secrete lysozyme enzyme

25. Which is the correct sequence of events during the phagocytosis of a bacterium by a leucocyte?

- I. Food vacuole forms
- II. Plasma membrane receptors detect antigen on the surface of the bacterium
- III. Lysosomes fuse with the food vacuole
- IV. Engulfs bacterium

- A. II → I → IV → III
- B. II → I → III → IV
- C. II → IV → I → III
- D. I → II → IV → III

26. Which labelled structures represent the epididymis and the prostate gland?

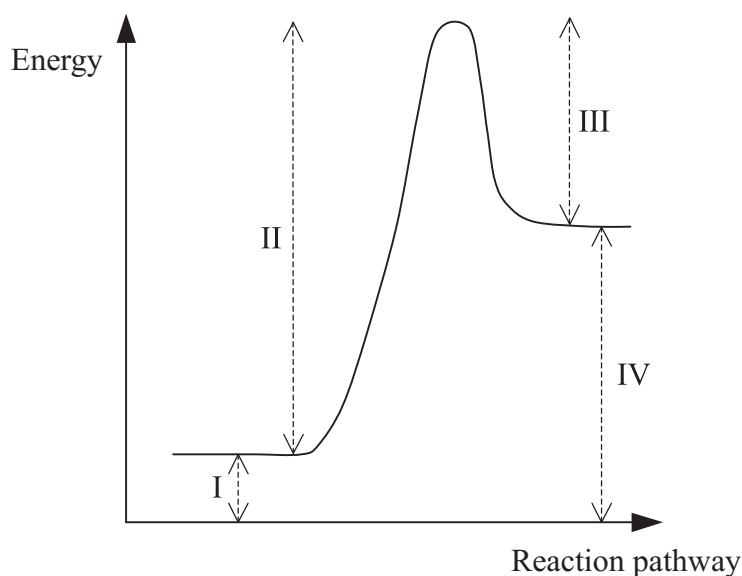


	Epididymis	Prostate gland
A.	I	III
B.	II	III
C.	I	IV
D.	IV	I

27. In the bacterium *Escherichia coli* the DNA can be replicated at nearly 2000 base pairs per second. Human DNA is replicated at more than 5 million base pairs per second.

Why is the replication of human DNA so much faster?

- A. Human cells have a higher concentration of DNA nucleotides in their cytoplasm.
 - B. Human cells have a faster form of DNA polymerase.
 - C. Human cells operate at a higher temperature.
 - D. Human cell DNA replication starts at several points simultaneously.
28. The reaction below shows the energy changes in a chemical reaction.



What would happen to the changes in energy if this reaction was controlled by an enzyme?

- A. I would increase.
- B. II would decrease.
- C. I and IV would decrease.
- D. II and III would decrease.

29. Which of the following reactions is an oxidation reaction?

- A. Pyruvate \rightarrow Acetate + CO₂
- B. $\text{FAD} + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{FADH}_2$
- C. Ribulose biphosphate + CO₂ $\rightarrow 2 \times$ Phosphoglycerate
- D. $\text{NADP}^+ + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{NADPH} + \text{H}^+$

30. The average surface area for the inner membranes of mitochondria in a epithelial cell is 40 m² g⁻¹. The surface area of the inner membrane of mitochondria from heart muscle cells is over 200 m² g⁻¹.

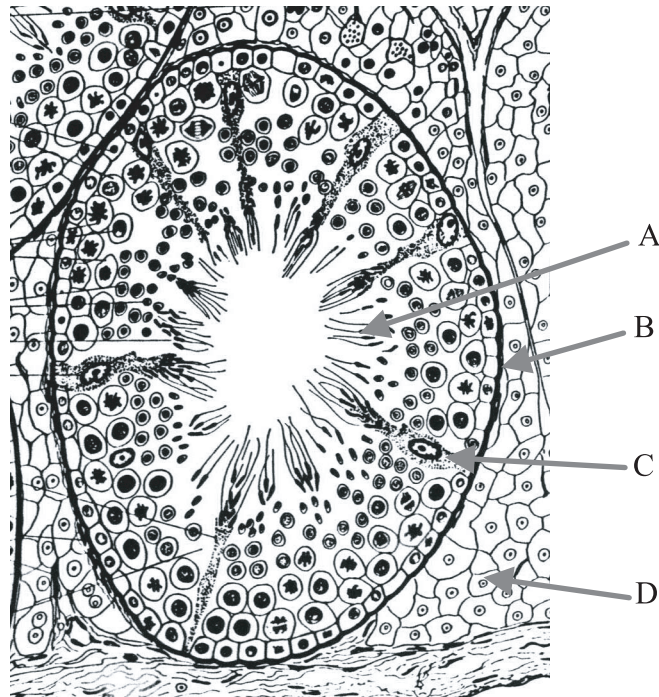
What is the reason for the large surface area of the inner membranes of the mitochondria in the heart muscle cells?

- A. They contain enzymes to hydrolyse ADP and inorganic phosphate to ATP.
- B. They contain enzymes to oxidize ADP and inorganic phosphate to ATP.
- C. They contain enzymes to reduce ADP and inorganic phosphate to ATP.
- D. They contain enzymes to condense ADP and inorganic phosphate to ATP.

31. A cross is carried out between two heterozygous individuals (AaBb) where the genes A and B are not linked genes. What would be the proportions of genotypic recombinants amongst the offspring of this cross?

- A. 0 %
- B. 25 %
- C. 75 %
- D. 100 %

32. Which of the structures labelled in the diagram below provide nourishment for developing sperm cells?



[Source: Freeman and Bracegirdle (1976), *An atlas of histology*, Heinemann, page 91]

33. Which hormone maintains the corpus luteum in the ovary of a woman at implantation?

- A. FSH
- B. LH
- C. HCG
- D. Progesterone

34. What is the difference between natural and artificial immunity?

	Natural	Artificial
A.	Uses a vaccine	Uses synthetic antibodies
B.	Response to an infection	Response to a vaccination
C.	Memory cells formed	No memory cells formed
D.	Only active immunity	Only passive immunity

35. When an impulse arrives at a synapse which way do calcium ions move?

- A. Into the synaptic knob from the synaptic cleft
- B. Into the post synaptic nerve cell from the synaptic cleft
- C. Out from the synaptic knob into the synaptic cleft
- D. Out from the post synaptic nerve cell into the synaptic cleft

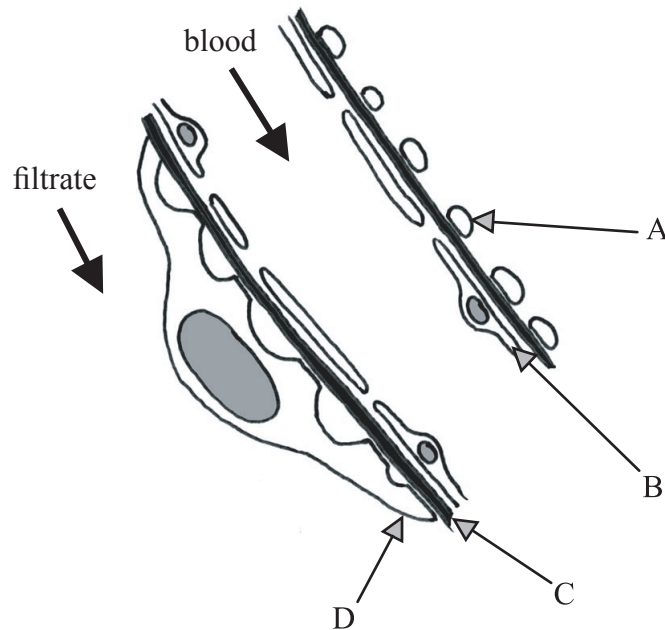
36. What are the characteristics of the skeletal systems of the following animals?

	Earthworm	Bird	Insect	Bony fish
A.	Solid and internal	Solid and internal	Solid and internal	Fluid and internal
B.	Fluid and internal	Solid and internal	Fluid and internal	Solid and external
C.	Fluid and internal	Solid and internal	Solid and external	Solid and internal
D.	Solid and internal	Solid and external	Solid and internal	Solid and external

37. What are the main excretory products of birds?

- I. Urea
 - II. Uric acid
 - III. Ammonia
 - IV. Carbon dioxide
- A. I and III only
 - B. II and IV only
 - C. III and IV only
 - D. II, III, and IV only

38. The diagram below shows part of the glomerulus from a kidney as seen under the electron microscope. Which part is the basement membrane?



39. Xerophytes and hydrophytes are adapted to their environments. Which pair of adaptations is correct?

	Xerophytes	Hydrophytes
A.	Air spaces in roots	Water storage in roots
B.	No stomata	No stomata
C.	Stomata in pits	Thin or no cuticle
D.	Thick cuticle	Stomata in pits

40. Which direction does the phloem transport materials?
- A. Up the plant at night and down the plant during the day
 - B. Up and down the plant all the time
 - C. Up the plant only
 - D. Down the plant only